cient to take a piece of tissue and submit it to a pathologist; in most cutaneous diseases the clinical diagnosis is needed also, and the clinical diagnosis is always important. That is where the radiotherapeutists fall down in the therapy of diseases of the skin; they do not know and cannot find out what they are treating, and they proceed blindly. Even if we agreed to the proposition that the radiotherapeutists should treat the malignant growths of the skin, and the dermatologists should treat the non-malignant ones, the radiotherapeutists would still need the dermatologist to tell them which was which. One cannot diagnose one kind of diseases of skin—malignant ones, for example—unless one knows the other kinds."

While Pusey emphasizes the fallacy of radiotherapy without correct diagnosis, what he says is equally true of all other methods of therapy when the physician does not know what he is treating.

1401 South Hope Street.

RUPTURED ECTOPIC PREGNANCY*

By LEON J. TIBER, M. D.
Los Angeles

DISCUSSION *by Edward N. Ewer, M. D., Oakland; James C. Doyle, M. D., Los Angeles; R. Glenn Craig, M. D., San Francisco.*

THE material on which this paper is based consists of 248 cases of ruptured ectopic pregnancies treated in the Obstetrical Service of the Los Angeles County General Hospital from June, 1927, to December, 1932. These patients were operated on by the attending men of that service, and so the technique of the operations varies to a certain degree. However, definite rules and regulations laid down by the chiefs of that staff were observed in all cases.

As is well known, there has been nothing new found either in the symptomatology or the treatment of ectopic gestation in recent years except autohemofusion, which was used in 123 cases in this series. However, it may be of value to enumerate the symptoms and signs as found in this series of cases.

On reviewing the 248 cases, it was found that there was no uniformity of symptoms or signs, and Kelly's [2] dictum that the most typical thing about ectopic gestation is that it is atypical, is certainly borne out.

Whenever a woman in the childbearing period suffering from acute abdominal pain with uterine hemorrhage is examined, one must consider the possibility of an ectopic pregnancy. In this series some of the cases were mistakenly diagnosed as acute appendicitis, uterine fibroid, dysmenorrhea, abortion, pyosalpinx, ovarian cyst, menorrhagia, and acute upper abdominal conditions.

* Read before the Obstetrics and Gynecology Section of the California Medical Association at the sixty-second annual session, Del Monte, April 24-27, 1933.

TABLE 1.—*Age*

Years	Percentage of Cases
.... – 20	3.4
20 – 25	22.3
25 – 30	27.3
30 – 40	41.2
40 – +	2.9
Not given	2.3

TABLE 2.—*Para and Gravida*

Para	Percentage of Cases	Gravida	Percentage of Cases
0	23.9	1	17.2
1	25.5	2	17.8
2	18.3	3	17.8
3	11.7	4	12.2
4	6.1	5	12.2
5 – +	7.2	6	6.8
Not given	6.7	7 – +	8.9
			6.7

TABLE 3.—*Abortions and Miscarriages*

Abortions	Percentage of Cases	Miscarriages	Percentage of Cases
1	8.2	1	8.9
2	6.2	2	6.8
3	0.06	3	0.05
4 – +	0.06	4 – +	0.02

While there was no unanimity of symptoms and signs, still the following were found in most of the cases: some irregularity of menstruation, pains in the pelvis (with or without attacks of fainting), spotting or uterine hemorrhage of varying degrees, enlargement of the uterus (with or without a tender mass to any side of it), pain on moving of the cervix, pain on defecation, pain referred to the subscapular region, and distention of the pouch of Douglas, with signs of internal hemorrhage and shock. In this series the most frequent differentials to make were abortions, incomplete or complete, tubo-ovarian disease, salpingitis, ovarian cysts, and uterine fibroids.

TABLE 4.—*Types of Menstrual Disorders*

	Number of Cases	Percentage
No missed periods	85	34.2
Missed period	118	47.6
Missed two periods	40	16.1
Missed three periods	5	2.0

TABLE 5.—*Pain in Ectopic Pregnancies*

	Number of Cases	Percentage
Sudden sharp pain with fainting	75	30.2
Sudden sharp pain without fainting	120	48.4
Sudden sharp pain after colicky pain	61	24.6
Colicky pain only	50	20.2
Shoulder pain	77	31.0
Shoulder pain not mentioned	177	71.4
No pain	4	1.6

TABLE 6.—*Abnormalities*

	Number of Cases	Percentage
Nausea	129	52.0
Vomiting	84	33.8
Abnormal periods	210	84.6
Spotting	72	29.0
Intermittent bleeding	92	37.0
Profuse bleeding	33	13.3

In sixty-nine cases where there was mistaken diagnosis, and in those patients where operation proved the disease to be salpingitis, the histories showed a preponderance of the following symptoms: high temperature with leukocytosis above 18,000, hazy history of infection and leukorrhea, a definite mass on one side of the uterus, with a

TABLE 7.—*Admission Temperature*

Temperature	Number of Cases	Percentage
97 or under 97	18	7.3
97.2 – 98.6	76	30.6
98.8 – 100	93	37.1
100.2 – 101	28	11.3
101.2 – 102	4	1.6
102 or over 102	3	1.2
Not given	26	10.1

suggestion of mass on the other side. It is surprising how few smear reports were found, especially when a positive smear might have been the deciding factor in the diagnosis.

Those cases proven ovarian cysts at operation gave a history of pain with faintness, irregular bleeding, and a fluctuating mass to one side of

TABLE 8.—*Admission Pulse*

Pulse	Number of Cases	Percentage
Unable to get	3	1.2
50 – 70	6	2.4
70 – 80	15	6.0
80 – 90	45	18.1
90 – 100	30	12.0
100 – 110	45	18.1
110 – 115	17	6.9
115 and over 115	40	16.1
Not given	47	17.9

the uterus. In those cases where the diagnosis of uterine fibroids was proven, there was a history of irregular menses, marked pain, and enlarged irregular uterus. Numerous times the patients denied the possibility of pregnancy, or else were not able to give a definite date of the last normal menses. From a review of these mistaken as well as correctly diagnosed cases, one must conclude that a careful history is still the best means of arriving at a correct diagnosis.

Various methods[7] have been suggested to establish the diagnosis. Vaginal puncture and aspiration of blood establishes the diagnosis after intraperitoneal rupture. Some advise routine diagnostic curettage, but it does not seem advisable, as it may destroy an existing intra-uterine pregnancy, and the microscopic findings are not always conclusive. Repeated blood studies have been advised, but the method seems to be far too procrastinating. The Aschheim-Zondek test is a new method of great value in the diagnosis of early pregnancy, and was used in some of the more recent cases of this series.

Had the puncture of the posterior cul-de-sac with a needle, to verify the presence or absence of free blood in the pelvic cavity, been practiced more often, many of the mistaken diagnoses could have been corrected. If done with the proper technique there is little or no danger of infection; and the puncture can be done without an anesthetic.

In 1914 F. Thies[8] of Leipsic first utilized the free intra-abdominal blood for infusion purposes in cases of ruptured ectopic gestation, and since then the method has found much favor in Europe. Appleby[4] of Canada reported nine cases of autohemofusion in ruptured ectopic gestation. Maynard and Reiss[5] of Vermont report one case. The latest American reference is by Ricci and Di Palma.[6] They report twelve cases of autohemofusion in ectopic pregnancy, and also review the literature and technique of procedure in their paper. They advise the use of the name "autohemofusion" in preference to autotransfusion.

The question of autohemofusion in ruptured ectopic gestation is of importance. It is not always easy to find a donor among the patient's relatives, where the patients are not financially able to get a donor of a known grouping. When a donor from among the relatives is found, much time is necessary for the proper blood studies, and time is a very important factor in a case of active bleeding. In autohemofusion a great deal of valuable time is saved. It allows the doctor to operate as soon as a diagnosis is made. It is a fairly simple procedure, especially as it is practiced at the Los Angeles County General Hospital. The patient is prepared in the usual manner. She is kept in a horizontal position, so that the free blood may gravitate to the pelvic cavity and thus facilitate its removal. When the peritoneum is exposed, a small incision is made, suction apparatus is inserted into the peritoneal cavity, and the blood sucked up into a receptacle. The blood is then

TABLE 9.—*Comparisons of Mortality Rates*

	Number of Cases	Deaths	Percentage
Autohemofusion only	123	1	.81
Direct transfusion and autohemofusion	66	2	3.03
Direct transfusion only	39	2	5.09
No transfusion	86	2	2.3
Total number of cases	248	7	2.8

TABLE 10.—*Blood Picture*

LEUKOCYTIC COUNT	Highest count: 48,000				Lowest count: 4,250		
Count in thousands	.. – 6	6 – 8	8 – 10	10 – 16	16 – 24	24 – +	Not given
Number of cases	2	24	27	71	66	24	34
Percentage	.7	9.7	10.9	28.6	26.6	9.7	13.7
RED CELL COUNT	**Highest count: 6,020,000**				**Lowest count: 1,100,000**		
Count in millions	1	2	3	4	5 – +		Not given
Number of cases	11	53	107	31	7		37
Percentage	4.4	21.4	43.0	12.5	2.7		14.9
BLOOD PRESSURE							
Systolic	40 – 50	50 – 75	75 – 100	100 –125	125 – 150	150 – 175+	Not given
Number of cases	2	20	46	84	52	5	39
Percentage	.7	8.1	18.5	33.8	21.0	2.0	15.7
Diastolic	10 – 20	20 – 40	40 – 50	50 – 75	75 – 85	85 – 125+	Not given
Number of cases	2	15	22	95	56	19	39
Percentage	.7	6.0	8.9	38.3	22.6	7.7	15.7

filtered through ten layers of citrate saturated gauze into a graduated container, the necessary amount of 2.5 per cent of sodium citrate solution is added and this mixture is immediately reinjected into the patient's vein with a 50 cubic centimeter syringe. The usual precautions of an ordinary transfusion are observed, and no unusual complications are encountered.

TABLE 11.—*Time of Operation After Admission*

	Number of Cases	Deaths	Per-centage
Operated same day..	145	..	.....
Second day	35	..	.....
Third day	12	2	16.7
Fourth day	22	..	.....
Fifth day	4	..	.....
Sixth day	6	2	33.3
Seventh day	6	..	.....
Eighth day	2	..	.....
Ninth day	3	..	.....
Tenth day	3	1	33.3
Twelfth day	3	..	.....
Thirteenth day	3	..	.....
Fourteenth day	3	2	66.6
Fifteenth day	1	..	.....

In this series most of the cases were operated on the same day that the patient was admitted to the hospital, as soon as the diagnosis was made. The only reason for any delay in operation was the uncertainty of the diagnosis. The chiefs of this service hold that as soon as a diagnosis of ectopic pregnancy is made, be it ruptured or unruptured, operation is indicated, and the result in this series of cases justifies that procedure. Thus we find that in the cases that were operated on the same day after admission, there were no deaths, and the deaths that occurred were in cases where they were operated on the third, sixth, tenth, or fourteenth day. As the cause of death in three cases was blood dyscrasia, it is of interest to note that in all these cases the operation was later than the third day. Is it reasonable to assume, then, that some change has taken place in the free blood in the peritoneal cavity that caused the dyscrasia after that same blood was reinjected into the patient's circulation? In the cases operated on the same day in which autohemofusion was done, no deaths were claimed to be due to blood dyscrasia. In the recent paper by Ricci and Di Palma [6] it was shown that the red cell count of the intra-abdominal free blood was microscopically normal as late as seventy-two hours after the time of the rupture.

There were seven deaths in this series: one in the cases of autohemofusion, two in the cases of autohemofusion and direct transfusion combined, two in the no-transfusion cases, and one in the direct transfusion only. Thus we see that in this series the lowest mortality is in the autohemofusion cases. However, in reviewing the causes of death in these cases, it is seen that in the autohemofusion death the cause was blood dyscrasia.

TABLE 12.—*Cause of Death*

Cause of Death	Auto-hemofusion	Direct Transfusion
1. Exsanguination and shock because of blood dyscrasia following operation for ectopic pregnancy	+	—
2. Exsanguination and shock because of blood dyscrasia following operation for ectopic pregnancy	+	+
3. Ruptured ectopic and hemorrhage into peritoneal cavity	—	+
4. Ruptured ectopic and diabetes mellitus	—	—
5. Ruptured ectopic and pulmonary embolus with terminal pneumonia	—	+
6. Ruptured ectopic and paralytic ileus with intestinal obstruction	+	+
7. Possible embolus to lung or brain	—	—

In the two cases where autohemofusion and direct transfusion were used, one died of paralytic ileus and intestinal obstruction, the other of exsanguination and shock caused by blood dyscrasia. In the cases where direct transfusion only was used, the cause of death was hemorrhage into the peritoneal cavity, possibly due to an error in technique; the other death being due to pulmonary embolus and terminal pneumonia. Surprising as it may seem, in the cases where no transfusion was done, one death was due to embolus, and the other was ascribed to ruptured ectopic pregnancy and diabetes mellitus.

Thus we see that the mortality rate in 123 cases where autohemofusion was used was .81 per cent; in sixty-six cases where direct and autohemofusion combined were used, the mortality rate was 3.03 per cent; in thirty-nine cases where direct transfusion only was used, the mortality rate was 5.09 per cent; and in the eighty-six cases where no transfusion was used, the mortality was 2.3 per cent. The combined mortality rate in this series was 2.8 per cent, a figure which compares very favorably with the mortality rates noted by other observers. Considering that many of the patients who are sent to the County Hospital are badly neglected ones, the staff is to be congratulated on the results obtained.

CONCLUSIONS

1. A study of 248 cases of ectopic gestation showed a mortality rate of 2.8 per cent.
2. In the 123 cases of ruptured ectopic gestation that have been autohemofused the mortality rate was .81 per cent.
3. Autohemofusion is a simple procedure, and with ordinary precautions is devoid of risk.
4. No elaborate equipment is necessary for autohemofusion, hence it may be used in the smallest hospitals.
5. Autohemofusion is a life-saving measure, especially for patients in imminent danger, and should be used in all cases with free intra-abdominal blood.
6. The morbidity and mortality is the lowest in the cases operated on immediately after diagnosis was made.
7. In case of doubt as to diagnosis, puncture of the posterior cul-de-sac is indicated.

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DISCUSSION

EDWARD N. EWER, M. D. (251 Moss Avenue, Oakland).—The success attending the procedure of intravascularization of the free peritoneal blood, in Doctor Tiber's series of 123 cases, is impressive. Considering the showing made for it, we must admit a broad field for autotransfusion; for neither donors, nor the fees to be paid to them, are always quickly available.

At present, if donors *are* easily to be had, I feel safer in transfusing and operating when the blood pressure and pulse have reacted. They usually do react in a short time, often within an hour.

An Alameda County Hospital patient was operated upon, pulseless, in profound shock and she succumbed. Four hundred and fifty cubic centimeters of citrated blood had been given during the operation. It seems unlikely that the substitution of the intraperitoneal blood would have secured a different result, but waiting for a reaction after the donor transfusion might have done so.

The slow intravenous injection of gum glucose solution, so much used at the New York Women's Hospital to combat shock, is highly efficient, and might profitably precede operation and autotransfusion. It is available in 300 cubic centimeter ampoules, ready for use.

Doctor Tiber notes that, as usual, there were many cases incorrectly diagnosed. Several of these were pyosalpinx and tubo-ovarian inflammations. In all hospital statistics it is found that many patients with ectopic pregnancies have histories suggestive of pelvic inflammatory disease, so the frequency of that admission diagnosis is not surprising. The author suggests that attention to the temperature curve, the leukocyte count, the palpation of masses, and especially the examination of smears, might determine the diagnosis. All these are valuable, and must be given full consideration; but the great importance of the blood sedimentation test is not mentioned.

In the Alameda County Hospital, sedimentation tests are made in the admission department on all cases in which abdominal infections are suspected. Even if tubal pregnancies were handled on the obstetric, instead of, as at present, on the gynecologic ward, they would still have the benefit of that test in the differential diagnosis. Of the last twenty-four cases in that hospital operated upon for tubal pregnancy, eleven had sedimentation rates over one hour, three between forty and fifty minutes, six between thirty and forty minutes, and two between twenty-five and thirty minutes. One, with a coincident salpingitis, and another with infection following a previous office curettage, had twelve- and thirteen-minute rates. No uncomplicated case had a rate under twenty-five minutes.

The rate is twelve to fifteen minutes, using the Linzenmier tube method in fully 95 per cent of the cases of pelvic inflammatory disease, with symptoms comparable in severity with those attending a ruptured pregnant tube. This test, consuming but a few minutes of time, will at once partition off the inflammation cases, thereby greatly aiding diagnosis.

Aspiration of the cul-de-sac is an extremely useful diagnostic aid. I have used it many times without accident, and consider it safe in careful hands.

When pregnancy is certain, and the question lies between intra- and extra-uterine, and palpatory findings are suspicious, and the uterine bleeding is sufficient to indicate disruption of the ovum if in the uterus, then curettage seems indicated. If no ovum is dislodged by the curette, laparotomy may be done at once.

Doctor Tiber has done us a distinct service in reporting a large enough series of autotransfusions to inspire confidence in the method. One should bear in mind his advice, that it is most useful and devoid of danger in the early hours after rupture, before changes have taken place in the blood to be injected.

JAMES C. DOYLE, M. D. (1930 Wilshire Boulevard, Los Angeles).—Doctor Tiber, with his data relative to age, symptoms, and findings, has presented an interesting paper on ectopic gestation. The early surgical intervention in so many cases is commendable.

That eighty-five, or 34.2 per cent, of the two hundred and forty-eight cases had not missed a period is significant. However, in this group are probably those who "went over five or six days," and it is felt that this "lateness" is as important as a missed period in the presence of other symptoms characteristic of ectopic pregnancy. It is well known that it is at times extremely difficult, even after rupture, to make a correct diagnosis. Salpingitis is more frequently confused with ectopic pregnancy than any other condition.

The "sedimentation test" will, I believe, in many cases prevent this mistake. The sedimentation time in acute salpingitis is from ten to fifteen minutes, while in ruptured ectopic gestation for the first twenty-four hours following rupture, the time will be close to normal, sixty minutes or more. Each day, however, makes the sedimentation time more rapid, due to protein absorption and peritoneal irritation of free blood.

The utilization of the free blood, by means of autohemofusion, should be more generally employed. The technique is quite simple, and the results, as Doctor Tiber has shown, are most gratifying.

The hormone test (Aschheim-Zondek or Friedman) is a valuable aid to diagnosis of pregnancy; but should there be a ruptured ectopic pregnancy, a wait of forty-eight hours for completion of the test would be hazardous.

Needling of the cul-de-sac as a diagnostic aid should be done, I believe, only as a last resort.

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R. GLENN CRAIG, M. D. (490 Post Street, San Francisco).—Doctor Tiber has very ably presented to us the results obtained in ectopic pregnancies, emphasizing the importance of autohemofusion as an adjunct to treatment. Without question, this is a valuable addition to our armamentarium, and often a life-saving measure, especially with patients who have had a tubal rupture with a large amount of fresh blood free in the peritoneal cavity. However, I am inclined to disagree with his conclusion that it is devoid of risk.

One death, with an autohemofusion, was due to a "blood dyscrasia" which might not have occurred had the autohemofusion been omitted. Another patient died from a "blood dyscrasia," who had an autohemofusion and a direct transfusion. Assuming that the blood-matching was properly done for the direct transfusion, this death must be attributed to the autohemofusion. The deaths due to intestinal obstruction, embolus, diabetes, pneumonia and secondary hemorrhage, have no bearing on the subject.

The mortality rate (0.81 per cent) among the 123 patients who had an autohemofusion compares most favorably with the mortality rate (2.8 per cent) of the general group. When an autohemofusion is done, the hemorrhage into the peritoneal cavity must be recent—less than three days old—and the fact that these patients were more promptly operated upon may be a factor in the lower mortality rate.

Autohemofusion would seem to be of greatest value in an ectopic pregnancy with tubal "rupture." In these patients the growth of the fetus, with the erosion of the tubal wall by the trophoblastic cells, causes an actual rupture of the tube with the sudden loss of large amounts of blood. While this usually produces the "classical" textbook picture of an ectopic pregnancy, it is not as common as the termination of the pregnancy by a tubal abortion, or the extrusion of all or parts of the fetus and placenta through the fimbria of the tube. The latter causes the loss of varying amounts of blood, depending upon the amount of separation which takes place at one time, and may be recurrent whenever a new portion of the placenta separates. Pain, in any portion of the peritoneal cavity, is due to the local irritation to the parietal peritoneum caused by the free blood. Careful attention to the details of the history will enable one to reconstruct clearly the various steps in the underlying pathology.

It is interesting to note that no change has occurred in the fundamental treatment since the rules drawn by Lawson Tait from his first three patients in 1883. He recognized, first, the necessity for an immediate operation, and secondly, the necessity for a quick operation. These two points may be illustrated by quoting his case reports.

In 1881 Doctor Tait was called into consultation by Doctor Hallwright when the patient was found in collapse and the uterus fixed by a doughy mass. The diagnosis of a ruptured ectopic pregnancy was made, and surgery was suggested and even urged by Doctor Hallwright. Tait lacked the courage to operate. A second hemorrhage killed the patient. A postmortem examination was held and the specimen injected. Tait found that the hemorrhage could easily have been controlled by a ligature.

In 1883 Doctor Tait was called to see a young woman of twenty-nine who was in collapse. Her history was that of an ectopic pregnancy with hemorrhage from rupture. She had missed but one period. Bed rest was advised and the patient improved. However, on the fifth day the patient got up and had another attack. Doctor Tait was called and operated immediately, removing clots, serum and débris. He found a ruptured left tubal pregnancy. He tied the left broad ligament, removed the pregnancy, washed out the abdomen, and put in a drainage tube. Nine days later the patient was convalescent.

A few months after the above patient he was called to see another patient "dying from hemorrhage." Immediately he opened the abdomen and found a fetus of twelve weeks, surrounded by clots, with the placenta adherent to the intestines. In an effort to be gentle he separated the adhesions too slowly, and was unable to ligate the vessels before the patient died. He, therefore, decided henceforth to operate quickly. Among his next thirty-nine patients he had only one death—a mortality rate of 2.56 per cent.

These principles laid down by Tait are just as true today as in 1883, but autohemofusion is probably the most important fundamental contribution of recent years.

PHYSIOLOGY OF THE SENSE ORGANS—SOME RECENT ADVANCES*

By J. M. D. OLMSTED, PH.D.
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DISCUSSION *by Chauncey D. Leake, Ph.D., San Francisco; William J. Kerr, M.D., San Francisco; Herman Adler, M.D., Berkeley.*

GIVEN the situation of the schoolboy, the bent pin, the teacher, and the teacher's chair, we will take it for granted that the introduction of the point of the bent pin into the epidermis of the pedagogue causes in the latter a sensation of pain. Philosopher, psychologist, physiologist, physicist, and physicial-chemist, all recognize that there is an unsatisfactory gap between the two events, (1) entrance of the pin into the pedagogue's epidermis and (2) his sensation of pain. To quote from Adrian, "If we belong to the extreme left wing of the behaviorist school, we may deny that the arrival of a sensory message produces anything except a further series of physical and chemical changes in the central nervous system, a complex of excitation and inhibition processes, and passages of impulses to and fro, ending in a

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